ELSEVIER

Ecological Modelling 75 (1994) v–ix

ECOLOGICAL MODELLING

Special Issue

State-of-the-Art in Ecological Modelling proceedings of ISEM's 8th International Conference in Kiel, 28 September – 2 October 1992

Edited by

B. Breckling and F. Müller

Projektzentrum Ökosystemforschung, University of Kiel,
Schauenburgerstr. 112, D-24118 Kiel, Germany

CONTENTS

1. Preface 1

2. Ecological Modelling and its Interdisciplinary Context

Models as instruments for combination of ecological theory and environmental practice
S.E. Jørgensen (Copenhagen, Denmark) 5
Socio-economic ecological models: criteria for evaluation of state-of-the-art models shown on four case studies
W.D. Grossmann (Leipzig, Germany) 21

3. Contributions of Modelling to Ecological Theory

Ecosystem Theory
On the behavior of some proposed goal functions for ecosystem development
V. Christensen (Makati, Philippines) 37
Sensitivity analysis of ecosystem dynamics based on macroscopic community descriptors: a simulation study
C. Pahl-Wostl (Dübendorf, Switzerland) 51
Thermodynamic aspects of species diversity in tropical and ectropical plant communities
O. Fränzle (Kiel, Germany) 63

Competition and Coexistence
Competition and coexistence: the contribution of modelling to the formation of ecological concepts
K. Ekschmitt (Mainz, Germany) and B. Breckling (Kiel, Germany) 71

Competition and coexistence: modelling approaches
W. Ebenhöh (Oldenburg, Germany) 83
Competition and coexistence: on the historical background in ecology and the influence of economy and social sciences
L. Trepl (Berlin, Germany) 99

Spatial and Temporal Organization of Ecological Processes
Modelling dieback phenomena in natural forests
F. Jeltsch and C. Wissel (Leipzig, Germany) 111
Nonequilibrium structures in plankton dynamics
H. Malchow (Jülich, Germany) 123
The simulation of fish schools in comparison with experimental data
A. Huth (Kassel, Germany) and C. Wissel (Leipzig, Germany) 135
Selforganization of fish schools: an object-oriented model
H. Reuter (Bremen, Germany) and B. Breckling (Kiel, Germany) 147

Theory of Population Dynamics
Host–parasitoid models in temporally and spatially varying environment
T. Wiegand and C. Wissel (Leipzig, Germany) 161
Nonlinear time series analysis of empirical population dynamics
F.R. Drepper, R. Engbert and N. Stollenwerk (Jülich, Germany) 171
Stochastic extinction models discrete in time
T. Stephan and C. Wissel (Leipzig, Germany) 183
Stochastic birth and death processes describing minimum viable populations
C. Wissel (Leipzig, Germany) and S.-H. Zaschke (Marburg, Germany) 193
Insect pest control by a spatial barrier
R. Marsula and C. Wissel (Leipzig, Germany) 203

4. Application of Ecological Models

Climate-related Ecological Changes
Global change and regional integrity
J.M. Robinson (Leipzig, Germany) 213
On the use of a simple deciduous forest model for the interpretation of climate change effects at the level of carbon dynamics
F. Veroustraete (Mol, Belgium) 221
The climate sensitivity of the Osnabrück Biosphere Model on the ENSO time scale
J. Kaduk and M. Heimann (Hamburg, Germany) 239

Physical Processes in Terrestrial Ecosystems
Estimation of dry deposition in the Bornhöved lake district with a resistance model
T. Spranger and E. Hollwurtel (Kiel, Germany) 257
A simulation model for the description of the one-dimensional vertical soil water flow in the unsaturated zone
D. Bornhöft (Kiel, Germany) 269
Soil erosivity by wind in moderate climates
R. Beinhauer and B. Kruse (Quickborn, Germany) 279
Wind erosion model development
B. Kruse (Quickborn, Germany) 289

Morphological and Physiological Models and Plants

Morphological models of plant growth: Possibilities and ecological relevance
W. Kurth (Göttingen, Germany) 299

Modelling optimal plant biomass partitioning
A.E. Kastner-Maresch (Bayreuth, Germany) and H.A. Mooney (Stanford, CA, USA) 309

The transpiration rate of a single tree – numerical simulations
U. Janssen (Hannover, Germany) 321

Modelling the influence of climatic variability on carbon and water budgets of beech saplings (*Fagus sylvatica* L.) based on field data
W. Stickan, D. Gansert, G. Neemann and U. Rees (Göttingen, Germany) 331

Linked stomata and photosynthesis model for *Corylus avellana* (hazel)
S. Von Stamm (Kiel, Germany) 345

Nitrogen Dynamics in Terrestrial Ecosystems

Nitrate leaching from agricultural soils: ecological modelling under different economic constraints
P. Botterweg, L. Bakken and E. Romstad (Ås, Norway) 359

Modelling water and nitrogen dynamics on catchment scale
E.-W. Reiche (Kiel, Germany) 371

Modelling the nitrate flow in the ground-water provinces of the "old" federal states of the Federal Republic of Germany
F. Wendland (Jülich, Germany) 385

Parameter acquisition for modelling exchange processes between terrestrial and aquatic ecosystems
W. Kluge, P. Müller-Buschbaum and L. Theesen (Kiel, Germany) 399

Modelling nitrogen transformations in freshwater wetlands. Estimating nitrogen retention and removal in natural wetlands in relation to their hydrology and nutrient loadings
J. Dørge (Hørsholm, Denmark) 409

Ecological Processes in Limnic Ecosystems

Modelling thermal stratification and calcite precipitation of Lake Belau (northern Germany)
G. Schernewski, L. Theesen and K.E. Kerger (Kiel, Germany) 421

Seasonal changes of trophic transfer efficiencies in a plankton food web derived from biomass size distributions and network analysis
U. Gaedke and D. Straile (Konstanz, Germany) 435

A model for decomposition of the drown vegetation in an Amazonian Reservoir
A. Pereira, B. Tassin (Noisy le Grand, France) and S.E. Jørgensen (Copenhagen, Denmark) 447

Ecological Processes in Marine Ecosystems

Biochemical feedbacks in the oceanic carbon cycle
O. Klepper, B.J. De Haan (Bilthoven, Netherlands) and H. Van Huet (Nijmegen, Netherlands) 459

Eutrophication modelling of the North Sea: two different approaches
J.W. Baretta (Hørsholm, Denmark), P. Ruardij (Den Burg, Netherlands), H.J. Vested and J.G. Baretta-Bekker (Hørsholm, Denmark) 471

A trophic model for *Ulva rigida* in the Lagoon of Venice
G. Bendoricchio, G. Coffaro and C. De Marchi (Padua, Italy) 485
Geoecology of Laguna de Bay, Philippines I. Techno-commercial impact on the trophic level structure of the Laguna de Bay aquatic ecosystem 1968–1980
M. Delos Reyes and R. Martens (Hamburg, Germany) 497

Ecotoxicology
Modelling effects of toxicants on pelagic food-webs: many problems – some solutions
H.J. Poethke, D. Oertel and A. Seitz (Mainz, Germany) 511
Simulation of the migration behavior of herbicides in unsaturated soils with a modified LEACHP-version
J. Rambow and B. Lennartz (Kiel, Germany) 523
Stochastic simulation of the regional pesticide transport including the unsaturated and the saturated zone
H.-J. Franke and G. Teutsch (Stuttgart, Germany) 529
Application of the software Ecotox on agricultural chemicals
B. Halling-Sørensen, S.E. Jørgensen and S. Winther (Copenhagen, Denmark) . . 541

5. Modelling Concepts and Techniques

EXPECT: A concise simulation system for environmental policy analysis
A.H. Bakema, K.F. De Boer, L.C. Braat, R.M. Kok, R. Meijers and J.G. Van Minnen (Bilthoven, Netherlands) 553
The SIMPLEX II simulation system to solve problems in environmental protection
J. Wittmann (Erlangen, Germany) 563
The expert system shell SAFRaN [1] and its use to estimate the contaminant load of ground water and soil caused by deposition of air pollutants
M. Burde, T. Jäckel, H. Hemker and R. Dieckmann (Kaiserslautern, Germany) . . 575
Expertsystem-model coupling within the framework of an ecological advisory system
M. Leimbach (Potsdam, Germany) 589
Simulation-based regional models – concept, design and application
M. Flechsig, M. Erhard and V. Wenzel (Potsdam, Germany) 601
A decision support system for regulating finfish aquaculture
W. Silvert (Dartmouth, Canada) 609
Using machine learning techniques in the construction of models. I. Introduction
B. Kompare, I. Bratko, F. Steinman and S. Džeroski (Ljubljana, Slovenia) 617
Feature-based model identification of nonlinear biotechnological processes
L. Vermeersch (Ghent, Belgium), B. Kroes (Delft, Netherlands) and P. Vanrolleghem (Ghent, Belgium) 629

6. Potentials and Limitations of Ecological Modelling

Mathematical models and understanding in ecology
V. Grimm (Leipzig, Germany) 641
Ecological systems engineering: toward integrated management of natural and human complexity in the ecosphere
B.C. Patten (Athens, GA, USA) 653

7. Concluding Remarks

Current trends in ecological modelling and the 8th ISEM conference on the state-of-the-art
B. Breckling and F. Müller (Kiel, Germany) 667

Keyword Index 677

Author Index 679